

by the action of water at the temperature of the body with formation of corrosive sublimate; and this change is accelerated by the presence of citric acid, sodium chloride, or sugar.

FROM analyses and examination of the distillation vessels used in zinc furnaces, Herren Schulze and Steiner (*Jahrb. für Mineral.*) have found that these vessels contain well-formed crystals of *zinc-spinell* (or zinc aluminate) along with crystals of tridymite. The authors discuss the bearing of their results on the natural formation of minerals of the spinell group in limestones; they point out that the generally accepted hypothesis that such limestones must have been in a fused state for some time, is not necessary, but that the minerals may have been formed by the action of vapour penetrating the solid hot limestone. The action of gases on a softened rock mass may give rise to molecular changes resulting in the production of various minerals.

PHYSICAL NOTES

A CONTINUOUS registering thermometer for recording the temperature of the body has just been described by its inventor, M. Marey. It consists of a brass tube communicating with a Bourdon manometer, containing oil, and closed. Any change of temperature, by altering the internal pressure, makes the curved manometer tube curl more or less, and to it is fixed an index which registers the movements by inscribing them on a recording cylinder. The thermometric bulb may be at some distance from the inscribing apparatus, being connected by a flexible tube of annealed copper. Two such bulbs may be applied to different parts of the body, even to the interior. It is possible therefore to note the relations between the temperatures of the interior and exterior of the body. If we remember rightly, an analogous but more portable instrument was suggested some time ago by Mr. Donald Macalister, but we are not aware whether his instrument is yet before the public.

PROF. E. LOMMEL describes in *Wied. Ann.* a new polarising apparatus in which two plates of platinumcyanide of magnesium, cut perpendicularly to the optic axis, are used as polariser and analyser, just as in the tourmaline pincette. Such a section of this crystal transmits a blue light, which, when the angle of incidence exceeds 2° , is found to be perfectly polarised in the plane of incidence, and it therefore can be used, if tilted to that extent out of perpendicularity to the axis, as a polariser for a pencil of parallel blue rays. One curious point in respect to the behaviour of a thin film thus prepared is the following:—Let ordinary non-polarised light be looked at through the crystal while the latter is normal to the line of sight. A white central spot, perfectly circular in form, and non-polarised, is observed in the middle of a blue field, which is polarised at every point radially. The only other crystals which can be used for polarising pincettes are the tourmaline and herapathite (iodo-sulphate of quinine): the point of difference between these and the platinumcyanide of magnesium is that while the two former (which are negative crystals) absorb the ordinary ray, and must therefore be cut parallel to the optic axis, the latter absorbs the extraordinary ray, and must therefore be cut at right-angles to the optic axis.

THE galvanic properties of carbon have been closely examined by Dr. Hanichi Muraoka, a Japanese student at Strassburg. He determined the specific resistance and the change of resistance with increase of temperature of all kinds of hard carbon, including Siberian graphite, gas-retort carbon, the artificial carbons used for electric lighting by several well-known firms, and even the graphitic compound used in Faber's lead-pencils. The [specific resistance (at 0°C.) of the last was 9520 , while that of the first was 12.2 . The artificially-prepared carbons ranged from 36.86 to 55.15 . In all however the resistance decreased with a rise of temperature, the coefficient of decrease being greatest for the Siberian graphite, least for a carbon pencil prepared from coke by Heilmann of Mühlhausen. This result entirely confirms the recent researches of Siemens and Beetz. The thermo-electric powers of the various samples of carbon were also determined, with respect to that of graphite; their thermo-electromotive force was in every case + to graphite, and varied from 423 microvolts for the Faber pencil carbon to 9.26 microvolts for the gas-retort carbon (of Parisian manufacture) used for battery plates.

HERR P. VOLKMANN observes that in the determination of the specific gravity of heavy liquids, such as quicksilver, by means of the specific gravity bottle or pyknometer, the change

of volume of the vessel caused by the internal pressure may introduce a source of error, especially as the glass vessel may suffer a sub-permanent strain from which its recovery is not immediate. He gives an example of this error in the case of a pyknometer provided with a capillary tube marked in equal divisions. This pyknometer was filled with mercury while standing in mercury until the top of the column stood at 68.1 divisions. On taking it out of the mercurial bath the column fell to 65.4 , and on dipping it it again rose to 68.5 . The necessary precautions to avoid this error having been taken, a redetermination was made of the specific gravity of distilled mercury at 0°C. , the density of water at 0°C. being assumed (at Pierre's value) as 0.999881 . The new value for the density of mercury comes out as $13.5953 \pm .0001$, which is a little less than the lowest of the values given by Regnault.

PROF. S. P. LANGLEY has made the following calculation:—A sunbeam one square centimetre in section is found in the clear sky of the Alleghany Mountains to bring to the earth in one minute enough heat to warm one gramme of water by 1°C. It would therefore, if concentrated upon a film of water 1.500 th of a millimetre thick, one millimetre wide, and ten millimetres long, raise it $83\frac{1}{3}^\circ$ in one second, provided all the heat could be maintained. And since the specific heat of platinum is only 0.0032 , a strip of platinum of the same dimensions would, on a similar supposition, be warmed in one second to 2603°C. —a temperature sufficient to melt it!

THE alteration of the zero of thermometers after undergoing sudden changes of temperature is a well-known phenomenon, as is also the gradual rise in the zero in thermometers during the first few months after they have been made. M. Pernet has lately examined the question whether the distance between the "boiling point" and the "freezing point" of a thermometer is constant at all different stages of secular alteration in volume of the bulbs, and finds that this is so, provided the freezing point be determined immediately after the boiling point. On the other hand, if the boiling point be determined and a long interval elapse before the zero is determined, there is considerable error. Suppose a thermometer to be (owing to recent heating or to long rest) in any particular molecular state. In this state its reading will probably be in error: but this amount (so far as due to the above cause) may be ascertained by immediately plunging the thermometer into ice, and observing the error of the zero reading. In order that a thermometer should read rightly at any particular temperature it should be exposed for a considerable time to the temperature for which exact measure is desired, or else for a few minutes to a slightly higher temperature.

THE transparency of ebonite to heat rays may be shown by the following pretty and simple experiment. A radiometer is set revolving by the light and heat radiated from an argand gas-flame or the flame of a paraffin lamp. When a thin sheet of ebonite is interposed the rotations continue though with slightly diminished energy. But the thinnest sheet of notepaper interposed suffices to check the revolution of the vanes.

PROF. GRAHAM BELL has sought to prove whether the diaphragms subjected to intermittent radiation in one of the forms of the radiophone did or did not execute mechanical vibrations. The experiment of Mr. W. H. Preece of attaching a Hughes' microphone to the disk had led to negative results. But Prof. Bell has shown that the central region of the disk (on which the rays fall) is set into mechanical vibration; and he has proved the point by employing a modification of the mechanical microphone of Wheatstone. A stiff metallic wire is fixed to the centre of a thin metallic disk mounted at the extremity of a flexible hearing tube. When the end of the wire is pressed against any vibrating body its sounds are heard, and the vibrations at different points of the disk of a radiophone can be successively explored. The vibrations are found to be almost entirely confined to the illuminated area at the centre of the disk. A Hughes' microphone attached to the edges of the disk would therefore not easily give any indications. With this simple apparatus one very curious effect was obtained. An intermittent beam of rays was focussed upon a brass kilogramme weight, and the surface was explored with the point of the metallic microphone. Over all the illuminated area and for a very short distance outside it a feeble but distinct sound was detected, but not over other parts.

MR. EDISON has devised a new meter for voltaic currents even more ingenious than the "Weber-meter" which he proposed a year ago to fix in houses supplied with electric lamps. In the

new instrument two copper plates are suspended in an electrolytic cell containing sulphate of copper in solution, and placed in a branch circuit through which a known fraction of the main current is shunted. The copper plates are hung upon a lever arm so adjusted that when by electrolysis one has grown a certain amount heavier (by deposition of copper) and the other grown an equal amount lighter, the lever tips up and reverses the current through the cell, and at the same time moves a registering dial-apparatus through one tooth. The action goes on again until the tilting lever is again overbalanced, and tipped back, when the current is again reversed, and another registration effected. Each "tip" clearly corresponds to the passing of an exact quantity of electricity through the cell, and the registered indications are therefore proportional to the total consumption. *But will it work?*

HERR ED. DORN has investigated the relation between the absolute diameters of molecules of gases and their dielectric capacity on the lines of a suggestion due to Mossotti, that the properties of dielectrics might be explained by supposing them to consist of non-conducting material, in which innumerable minute particles of conducting matter are imbedded.

EVERYONE knows that the very feeblest currents produce audible sounds in the telephone, which is more sensitive than any galvanometer to feeble currents. M. Pellat lately declared that the heat necessary to warm a kilogramme of water one degree would, if converted properly into the energy of electric currents, suffice to produce in a telephone an audible sound for ten thousand years continuously.

GEOGRAPHICAL NOTES

THE preparations for the International Geographical Congress, to be held in September next at Venice, together with a Geographical Exhibition, are advancing rapidly. The *Bolletino* of the Italian Geographical Society announces in its last number that the saloons for the Exhibition are already distributed among the exhibitors, and that the nations which will occupy the most space will be Italy, France, Germany, Austria and Hungary, Russia, and Switzerland. The saloons allotted for the Exhibition in the royal palace being insufficient, it was agreed immediately to proceed to the construction of provisional buildings. The Italian railway companies have granted a reduction of 30 per cent. on the prices of tickets, and of 50 per cent. on goods for members of the Congress. The Austrian Lloyd and the Navigation Company, "Rubattino e Florio," grant a reduction of 50 per cent. on passengers' fares. As to the questions to be discussed at the Congress, the Commission has already published in the *Bolletino* its reports on most of them. Among the questions are:—On the Present State of Telegraphic Determinations of Longitude, by G. Lorenzoni.—On the Determination of the Temperature of Sea-water at Different Depths; on the Measurement of Depths; on the State of the Surveys of Coasts, &c., by G. B. Magnaghi; on the Extinction of Aboriginal Races, by L. Hugues; and on the Teaching of Geography in Schools, by L. Schiaparelli. We do not hear of any great activity in the collection of British exhibits for the annexed exhibition of geographical apparatus, &c. In England, indeed, no great interest is felt in these congresses. In Russia, on the contrary, a collection of apparatus has for some time been in preparation. M. Grigorieff is to represent the Russian Government and the Imperial Geographical Society at Venice.

The Swedish Government has decided to send a scientific expedition to Mossel Bay in the course of next year, for the purpose of collecting meteorological information. The expedition will be directed by Capt. Malmberg, and will have to remain during the summer of 1882 and the winter of 1883, in order to obtain the observations of an entire year. Mossel Bay is situated to the north of Spitzbergen, lat. 79° 54', long. 16° 15'. The locality is well known to the Swedes. Prof. Nordenskjöld stayed there in the winter of 1872-73 with three ships. A Swedish man-of-war will take the expedition to Mossel Bay, under the command of Capt. Palander, who, after having fixed the special meteorological station of Capt. Malmberg, will return to Sweden.

WE find in the last number of the *Bolletino della Società Geografica Italiana* a paper on the journey of the late Signor G. M. Giulietti from Zeila on the Gulf of Aden to Harar. This journey was accomplished in 1879, and the narrative was intended to form part of the complete description of all Signor Giulietti's travels, but after his death M. Guido Cora published

this small fragment with a map of the country. We notice also in the same publication a paper by Prof. G. Pennesi on the Italian missionaries who travelled in Lower Guinea during the second half of the seventeenth century; also accompanied with a small map of the country. The author speaks at some length of the two most interesting journeys of P. Dionigi Carli from Piacenza, and of P. Gio. Antonio Cavazzi from Montecuccolo.

COUNT WALDBURG-ZEIL, the well-known scientific explorer, started from Bremerhafen on board the steamer *Luise* for the River Yenisei on the 22nd of last month. The journey is undertaken solely for scientific purposes, Count Waldburg-Zeil intending to make collections illustrating the fauna of the Siberian coast and the sea in that district.

In a letter just received from the Gaboon Père Delorme reports the foundation of a mission station on the Ogowé River, which the French are making peculiarly their own. The station is placed at the east end of a large island in the river, called by the natives Ozangé-Nengé, *i.e.* Island of Light, which is conveniently situated for communicating with the tribes on the banks of the Ogowé and the Ngunié, one of its principal affluents. Immediately round the station are the Galois; next to them, on the right bank of the Ogowé, come the Eningas, while further south, on the left bank, or rather on the banks of a branch of the Ogowé, which goes to form Lake Ajingo, are found the Adyombas. Père Delorme expresses a decided opinion that these three tribes are really one people; they all speak the same language and have the same laws. All of them are very vain and voluptuous. The Galois despise agriculture, and are a trading people. They go up beyond the rapids of the Ogowé in search of india-rubber, ivory, and ebony. The slaves, or in default of them the women, are left to attend to the cultivation of manioc, banana trees, ground-nuts, and sugar-cane.

THE statement that an instalment of the Geographical Society's large map of Eastern Equatorial Africa will be issued this month is, we learn, unauthorised; and though, probably owing to the long delay which has already occurred, the propriety of issuing the map in parts has been discussed, the question is still left open. When ready, the map will be published by Mr. Stanford.

THE fourteenth Congress of the Italian Alpine Club will meet at Milan on August 29 to September 2 next. An Alpine exhibition will also be held, and three excursions will be made: the first to Erba in the Brianza and the grotto of Pinto, the second *via* Como to Varenna on the Lake of Como, and the third to Etico, coupled with an ascent of Monte Grigna.

THE death is announced of the well-known African traveller Herr J. M. Hildebrandt. He died on May 29 last at Tananarivo (Madagascar).

DR. O. FINSCH, the Polynesian traveller, safely arrived at Sydney from New Britain at the beginning of May. He stayed over eight months in New Britain, and has thence sent forty-five cases containing natural history collections to Berlin *via* Hamburg. These collections consist of no less than 12,000 zoological specimens, a large number of anthropological objects, besides a series of ethnographical specimens, surpassing in number and completeness any collections yet made in this field. Dr. Finsch intends staying only a short time at Sydney, and then proceeds to New Zealand in order to become acquainted with real Maoris, for the sake of comparison with the Polynesian and Mikronesian races he has studied so minutely. Afterwards the traveller, in continuation of his Melanesian researches, intends to visit North Australia to see and study the so-called Australian negroes. For the same purpose he will try to stay upon New Guinea for some time, as he considers the minute study of real Papuans of great importance.

NEWS has been received from Commander van Boekhuysen, the leader of the Dutch North Polar Expedition. He writes from Vardö to say that the *Willem Barents* could not reach Spitzbergen. The ice extended in a compact mass from 68° 30' N. lat. and 6° W. long. to 73° 30' N. lat. and 14° E. long., some twelve geographical miles to the north of Vardö. There was ice also some thirty geographical miles south of Bear Island. Commander van Boekhuysen will make another attempt to get northwards in 72° N. lat., and then return home after a month, as he is convinced that Novaya Zemlya is completely inclosed in a barrier of ice.

LETTERS from Dr. W. Kobelt have just been received by the Rüppell Institution at Frankfurt, who are the promoters of the expedition. The letters are dated from Oran. Dr. Kobelt's